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ABSTRACT

A national study was conducted to assess the current and planned use of word processors and microcomputers in small two-year colleges. Questionnaires were sent to 305 colleges with an enrollment of 3,000 students or less, requesting information on the present status of and future plans for word processor and microcomputer procurement, use, and staffing; hardware and software trends and patterns; policies guiding decisions on purchasing, operating, staffing, and locating equipment; and suggestions on the use of microcomputers in small colleges. Based on responses from 168 of the colleges, study findings revealed: (1) 88% of the respondents reported the current use of word processors, with 60% of these respondents using dedicated word processors; (2) 51% of the word processing use was for direct instructional application, 31% for administrative application, and 18% for instructional support; (3) over 91% of the colleges reported having at least one microcomputer on campus; (4) 81% of the colleges projected the acquisition of additional microcomputers over the next 3 years to an average of 25 units per institution; and (5) the major programming language used in the colleges was BASIC, which was used by 94% of the respondents. The report includes discussions of information systems in small two-year colleges, the implications of study findings, and future directions in the areas of hardware and software, personnel, and policies. (HB)

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Word Processing and Microcomputers in Small Two-Year Colleges: A National Study

By
Louis W. Bender
and
Lora P. Conrad

A Research Report
of the
Institute of Higher Education
Department of Educational Leadership
College of Education
The Florida State University

DECEMBER 1983

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WORD PROCESSING AND MICROCOMPUTERS IN SMALL TWO-YEAR COLLEGES:

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PREFACE

We are happy to continue the Research Reports series initiated by the Institute in 1982. Previous publications have included Research Reports growing out of the Fellows Program and a monograph series reflecting projects of the higher education faculty.

ABOUT THE STUDY

This study originally was proposed as part of the Institute Small Grants Program for Research Projects. Because of severe budget cuts for FY 82-83, support for the research activities was provided by the Northwest Alabama State Junior College and the State and Regional Higher Education Center, an affiliate of the Institute. We are grateful for the cooperation and assistance provided at a time when Institute funds were unavailable.

The focus of this study was upon the dynamic evolution of microcomputer and wordprocessing technology in the small two-year college. In an earlier study of computers and information systems in such colleges, the investigators found little or no use or knowledge of computers at most small colleges and only a few were using computers extensively for administrative operations and educational training. The results of this study, therefore, are startling in the rapidity of change and the broad scope of microcomputer and word-processing technology now found in small two-year colleges. Yet, such rapid and extensive growth generates other problems as identified in this Research Report.

ABOUT THE INSTITUTE

The Institute is dedicated to a mission of research and service at the state, national, and international levels. Four purposes have been identified by the higher education faculty including: (1) To focus upon institutional, state, regional, and national issues of management, governance, finance, educational programs and educational services through descriptive and analytic studies or through synthesizing analytic or evaluative aspects of postsecondary education; (2) To serve Florida State University as well as the State of Florida as a resource for policy analysis and research on issues of post-secondary education within the scope of the Institute's mission; (3) To complement the scholarly activities of the graduate program in higher education of the Department of Educational Leadership; and, (4) To serve as an initiator of activities and services intended to assist practitioners to deal better with problems and issues confronting immediate and future dimensions of institutional operation and vitality.

We welcome inquiries or proposals relevant to the mission and purposes of the Institute.

Richard E. Hulet
Institute Director

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Thanks to President Charles Britnell of Northwest Alabama Junior College for the institutional support provided.

WORD PROCESSING AND MICROCOMPUTERS IN SMALL TWO-YEAR COLLEGES: A National Study

BACKGROUND

Small two-year colleges represent a strategic element in the nation's postsecondary education system. These institutions are often the only resource available for educational access, occupational preparation, upgrading, updating or retraining. The use of new technology for instructional and administrative applications in such institutions is critical if they are to fulfill their mission and to realize their full potential.

Microcomputers are a major force in K-12 where several hundred thousand computers are already in use, at major universities such as Stanford where there are "hundreds" of microcomputers on campus (McCredie: 1983: 150), and at colleges like Clarkson or Dallas Baptist College where every student has a microcomputer (INFOWORLD: 1983: 20). In the total market place, microcomputer sales are doubling each year and may reach $25 billion by 1986 (COMPUTERWORLD: 1983: 60). What then is happening to microcomputer and word processor use in the small college?

An earlier national study was conducted to examine the present and future status of uses of computers and development of information systems, and was reported in a monograph dated January, 1983, titled Computers and

Information Systems in the Small Two-Year College (Conrad and Bender). The earlier study found that most two-year colleges were in the Initial Stage to Basic Stage of development using the four level classification of Robbins, Dorn, and Skelton (1975: 5-13) which defines the Initial Stage as where there is little use or knowledge of computers whereas the Basic Stage describes an institution that has access to computers but with few present administrative applications and generally limited knowledge of computers within the institution. The other two classifications are the Operational Stage where computing is used extensively for administrative operations and educational training and the most sophisticated or Extended Stage where the computer impacts throughout the institution with advanced administrative applications, instructional applications and multiple service types available. Robbins, Dorn, and Skelton found institutions in each of the four stages with only a few in the Extended Stage and many of the larger institutions in the Operational Stage of "moderate sophistication" in 1975.

A series of implications for the small college were identified in the earlier study that revealed the absence of systematic planning and policy development associated with the introduction, procurement, uses, operation, and security of computers and information systems (Conrad and Bender: 1983). The absence of such planning and policies resulted in problems associated with selecting hardware that could

serve multiple user needs, be compatible with past and future hardware configurations, and contribute to the long range utilization of new technology in the college (Bender and Conrad: 1983). Similar problems were observed when software identification, evaluation, development, documentation, and use were involved. Another critical area having implications for small colleges was the tendency of institutions to understaff in number and/or appropriate training and experience the supervisory and operational computing areas, and a persistent problem was the lack of knowledge and expertise on the part of most administrators concerning the technical aspects of computers and information systems. As a result, many institutions were observed to be realizing far less than the true potential of the new technology and a few institutions had already become disenchanted, even alienated.

The microcomputer, almost unheard of in 1978, is predicted to be on the desktop of every "desk worker" by 1990 (RS: 1982: 35). The technological advances that are lowering costs and making that possible are continuing to be made each week, as a brief review of any issue of COMPUTERWORLD or INFOWORLD will tell the reader.

The battle for a share in the market has intensified as more and more manufacturers submit microcomputer entries. But, IBM in less than two years has outstripped all the others and now has 26 percent of the current market for personal computers, with further gains anticipated. This is

sure to impact college buying trends as well. (Business Week: 1983: 76).

In the software area, a year ago, VISICALC was synonymous with spread-sheet packages; WORDSTAR with microcomputer word processing . Already, packages such as LOTUS' 1-2-3 are overshadowing both. So software and hardware are exciting, dynamic fields--full of what are often short-lived new products, with each new round of hardware cheaper, more powerful and the software more flexible.

Business data processing managers are fast utilizing this new technology for local area networks. Recent informal survey results (Hafner: 1983: 24) reported that seven out of ten such managers have either already installed a local area network or will do so within a few months.

Already, industry management has made the microcomputer the most popular delivery system for computer literacy training. (Paoini: 1983: 26). Software accessible on the microcomputer has exploded so that entire volumes are dedicated to software synopses for everything from music instruction to math software. For example, there are more than 2,000 software packages available for CP/M (a microcomputer operating system) alone.

Industries , like colleges, are now faced with policy decisions on microcomputer utilization. For example, Snow (1983: 50) in discussing industry needs, recommended that such a policy include steering committees, purchase

policies, application program documentation, software libraries, training, communications, and security. Each of these are essential for college policies to address as well. Cortada cites the need for policies that include equipment distribution, cost of maintenance , inventory control, standards for compatibility for hardware and software--especially for word processing hardware and software (1983: 25-26). Industries have often been characterized by haphazard microcomputer acquisition, which is now being halted as almost three-fourths of over 1,300 firms studied indicated that they either have or are planning a microcomputer acquisition policy (Laberis: 1983: 1-6).

Now that microcomputer technology has made it possible for small colleges to increase their involvement with and role in the new technology, it was appropriate that this study be carried out, to determine how and if this is being done.

STUDY DESIGN

The Issues

Issues were identified which could provide direction and focus to the inquiry. A series of questions encompassing the issues associated with the present and future status of word processors and microcomputers in the small two-year college were formulated. These included:

> What is the present status of word processor procurement, use, and staffing in small colleges?
>
> What plans are there for future procurement, use, and staffing of word processing technology?
>
> What is the present status of microcomputer procurement, use, and staffing in small colleges?
>
> What hardware and software trends or patterns can be identified?
>
> What policies guide decisions on purchasing, staffing, operating, and locating microcomputers on small college campuses?
>
> What suggestions do the respondents of the study have for introducing and using microcomputers in small colleges?

To answer these questions and to discuss issues relating to them, information was sought through a national survey. In addition, the educational and technical literature were reviewed to provide a basis for comparison. Overall determination of implications as identified necessarily include the experiences and observations of the investigators in over five years of working with small two-year colleges in the introduction, development, improvement, or evaluation of the use of computers, both in information systems and instructional programs.

The National Study

The survey population involved all public accredited two-year colleges with membership in the American Association of Community and Junior Colleges with a fall 1981 headcount of three thousand or less. The 1982 AACJC Directory served as the source for identifying the colleges meeting such criteria and provided the addresses. A study set of 305 colleges was identified.

The procedures utilized in conducting the study were:

1. Determined institutions to survey.
2. Developed survey instrument.
3. Evaluated survey by sending to a sample.
4. Revised survey.
5. Mailed survey to all colleges selected.
6. Follow-up on non-respondents.
7. Tabulated results using a computer based procedure.
8. Analyzed and reported results.

Of the initial group of 305 small colleges, a total of 168 or 55 percent of the total provided survey results suitable for analysis. Of this 168, 88 percent or 148 reported some type of wordprocessing capacity while 91 percent reported having at least one microcomputer.

RESULTS

Part I: Word Processing

Of the 168 institutions participating in the study, 88 percent reported current use of word processing with 50 percent of these using dedicated word processors. Use of microcomputers for word processing was reported by 53 percent while 36 percent of the respondents indicated use of a terminal to a minicomputer or mainframe for word processing. Obviously, some institutions use a combination of equipment types which is reflected in the percentages reported being more than 100 percent. Of the 36 percent (60) reporting use of terminals to a mainframe or minicomputer for word processing, only five are off-campus hookups.

The type of hardware used for word processing at the colleges is a broad assortment of 26 different vendors which is illustrative of the dynamics of the new technology market and the array of vendor names confronting potential buyers during the last couple of years. IBM was the dominant manufacturer of hardware used for word processing representing 26 percent of the respondents while Tandy-Radio Shack equipment was reported in 18 percent of the colleges, Apple in 15 percent, Lanier in 13 percent, and DEC in 6 percent of the respondent institutions. The remaining institutions were distributed among 21 other vendors. Seventy-eight percent of respondents indicated that their word processing units were stand alone units while 8 percent

reported use of shared logic equipment and 12 percent reported local area micro networks used for word processing. The overall word processing use among the respondents was 51 percent direct instructional application, 31 percent administrative application, and 18 percent instructional support application.

The colleges were asked how staffing for word processing is accomplished. Fully 80 percent of the respondents reported added responsibility being placed upon existing staff while only 27 percent had accommodated staffing by reassignment of existing staff as operators and less than 10 percent had hired operators. To examine present and future policies related to word processing, institutions were asked their policy on procurement. Word processors are selected by the same method as microcomputers in 44 percent of the colleges while 20 percent reported that the procurement policy for word processing was the same as that for typewriters and 21 percent indicated each office or department selects its own equipment. Note that only 5 percent of the respondents require word processing equipment to be of the same type as that already on campus. When asked to look at the future, fully two-thirds of the small colleges plan to purchase more word processing units over the next three years. While not all respondents projected the number of units to be acquired, those that did, averaged 9 units per college. Interestingly, 69 percent of respondents forecast that their word processing capability

will interface with the other computing capability on campus within the next three years. The vendor preferences as projected in future acquisitions are IBM, DEC, Lanier, Apple, and Radio Shack with almost no other vendor listed. In view of the 26 different suppliers of equipment reported earlier, this represents a strong shift toward the 'bigger names' in new acquisitions, away from their current vendors.

Though dedicated word processors are still the "Cadillacs" of word processing, the trend is obviously toward word processing as a capability on the hardware used for other purposes within the college, rather than dedicated equipment. This reflects the industry trend of providing word processing on almost every micro, on the large IBM main frame, as well as on the dedicated Lanier, Wang, and other word processors. In doing this, colleges are also becoming wiser in their purchases, turning to well-established, better names in equipment.

Part II: Microcomputers

Over 91 percent of the small two-year colleges reported having one or more microcomputers on campus. Apple was the major vendor reported with 44 percent of the units; Tandy-Radio Shack (TRS) was second at 34 percent of the units and Commodore third with 6 percent. The IBM personal computer was reported as already installed by only 3 percent. The remainder of units were reflected in a range of assorted vendors. The microcomputers are predominantly used as independent units (96 percent) though 20 percent of the

respondents reported their units are also part of a local area network.

In examining the software used, a preponderance of institutions gave BASIC as the primary programming language in use on their microcomputers, with FORTRAN and PASCAL, while far below BASIC, almost equal in popularity. The most often reported purchased software packages were VISICALC (a spread-sheet package) with 31 percent, SCRIPTSIT (a TRS word processor) with 12 percent, APPLEWRITER (a word processor from Apple) with 10 percent, and WORDSTAR (a CP/M word processor) with 6 percent. Numerous other software packages were reported but none with a sizeable constituency. In examining the question of locally developed software, it was found that 59 percent of the respondents reported development of instructional software while 38 percent reported software development for administrative purposes and 26 percent had developed local software for testing and/or scoring while 13 percent had developed local word processing software. The applications of microcomputers were reported as 68 percent direct instruction, 20 percent instructional support, and 12 percent for administrative purposes.

The location of microcomputers within the small college as well as the authority for distribution and access were examined. Instructional lab officers were identified as having the authority for distribution (59 percent) with the campus pattern for location of microcomputers being

primarily in centralized labs for instruction (75 percent) and lab hours being the basis of control for microcomputer access in 58 percent of the cases. The preponderant use of microcomputers in instruction is reflected in the locus of responsibility--they are identified with academic departments in 52 percent of the cases in contrast to the computer center where only 12 percent of the respondents indicated the primary location of microcomputers. This would suggest a shift in computing responsibility on campus where historically computer location and supervision would be in the computer center.

The communications capability of microcomputers is nowhere near fulfilling its potential in current use within small colleges. Fifty-two percent of respondent institutions indicated no communications capability while only 14 percent reported local microcomputer hookup and another 16 percent reported local network usage.

Procurement of microcomputers in small colleges is overwhelmingly through direct purchase (98 percent). State funds (43 percent) are the predominant source of funds for microcomputer procurement while local funds were reported by 26 percent of the respondents and federal funds were used by 24 percent of the respondent colleges. Private funds were identified by 4 percent of the institutions as the primary source of procurement funding.

The reasons given for selecting microcomputers rather than other computing capability were given as lower cost (44

percent), improved accessibility (20 percent), and software (9 percent); 9 percent of the respondents indicated personal preference of a user as the primary reason for selection. Only 1.4 percent identified college policy as the reason for such selection. Other justification included community interest, keeping up with technology, and lack of technical knowledge. The study attempted to identify the highest authority involved in approval of microcomputer purchases. Approval by the president was the most frequent policy reported with state office approval being second at 29 percent and academic dean approval indicated in 16 percent of the institutions. Computer committee review was identified by 7 percent of the institutions as the source of approval. Sixty percent of the respondents indicated the existence of a policy requiring compatibility of hardware for new purchases while 40 percent of the institutions reported none.

Staffing for operation of microcomputers revealed a similar pattern to that of staffing for word processing equipment operation. Eighty-seven percent of the institutions reported that staffing was an added responsibility placed upon existing personnel. The type of personnel providing microcomputer support was reported as an average of 1.2 data entry staff per college, 1.66 programmers per college, and 3.35 lab assistants per college.

When examining future plans, it was found that 81 percent of the institutions project acquisition of additional microcomputers over the next three years for an average of approximately 25 units per institution. The most popular vendors when rank-prioritized are Apple (40 percent), Tandy-Radio Shack (20 percent), IBM (15 percent), and DEC (7 percent) with the remainder being an assortment with none having a noticeable constituent group. When queried on the projected applications of new microcomputers, the respondents indicated direct instruction (43 percent), instructional support (69 percent), administrative (45 percent), and communications capability (37 percent).

The survey also sought to identify major problems in introducing microcomputers and/or word processors on campus, requesting the respondents to rank prioritize the problems identified. Cost was most clearly perceived as the major problem with 51 percent of the institutions ranking it as major. Twenty-two percent of the respondents identified lack of user knowledge as the major problem and 6 percent felt lack of technical knowledge to be the most significant drawback.

Only half of the institutions (53 percent) indicated an existing computer literacy course for faculty and staff while 63 percent of those that do not have such a course indicated they plan to do so in the future. When asked who is responsible for implementing such computer literacy courses, the respondents indicated the computer science

faculty (43 percent) most often, the computer center staff (27 percent) and the math/science faculty (24 percent).

Part III: Profiles

The profiles growing out of the results of Part I (Word Processing) and Part II (Microcomputers) are as follows:

Word Processing Profile. Eighty-eight percent of the small two-year colleges responding to this study have some type of word processing capability. Twenty-eight percent of the colleges have two or more methods of word processing presently in use. Of the three methods being used, 60 percent use dedicated word processing (of which most are stand alone units), 53 percent use microcomputers for word processing and 36 percent use terminals to a mainframe or minicomputer for word processing. Only eight percent of the mainframe or minicomputers are off-campus. IBM is the preferred word processing equipment vendor and is projected to continue in that role. DEC is now the fifth most popular vendor of word processing equipment but is projected as second in current procurement plans. Tandy-Radio Shack which is now second in popularity (18 percent) ranks fifth in the preferred vendors in acqusition planning. Over two-thirds of the small colleges have definite purchase plans over the next three years with an average of nine or more units per institution. Over two-thirds of the institutions also plan to interface word processing with data processing, an indication of a more sophisticated knowledge level among the small colleges.

Microcomputer Profile. Ninety-one percent of the small colleges have and use microcomputers already. The majority of institutions have established a centralized microcomputer laboratory, primarily for direct instruction, with an average of 12 microcomputers. The programming language is almost exclusively BASIC (94 percent) with some FORTRAN (23 percent) and PASCAL (20 percent). The colleges are experimenting with a variety of purchased software packages although many are attempting to develop their own locally. Over one-third of the small colleges have a word processing package (usually WORDSTAR, SCRIPSIT, or APPLEWRITER) and nearly the same number have a spread-sheet package with VISICALC the most popular. Local software development for computer assisted instruction (CAI) is taking place in rank priority order in the following areas 1) computer instruction, 2) math, 3) business, 4) chemistry, 5) psychology, and 6) engineering/engineering technology.

The most popular vendors presently are Apple (44 percent), Tandy-Radio Shack (35 percent), Commodore (6 percent), and IBM (3 percent) while the projected vendors over the next three years would be Apple (40 percent), Tandy-Radio Shack (20 percent), IBM (15 percent), and DEC (7 percent). The projected addition of systems was from 2 or 3, to 35, and a few have over 100 additional computers planned. Microcomputing is in addition to other computing capability at nearly all small two-year colleges, as only 7 percent of the respondents had only microcomputers on campus

for computing capability. The communications capability used with microcomputers, while limited at the present time, is projected to increase significantly in the future.

There has been an absence of policies among the two-year colleges in the areas of microcomputer procurement, staffing, usage, and evaluation.

Part IV: Respondent Suggestions

Survey respondents were asked to provide suggestions or comments on introducing microcomputers and/or word processors on campus. An unusually large segment, almost 40 percent, of the respondents took the time to complete this open ended question. The response rate would suggest a high level of interest as well as a universal feeling of being a battle-proven veteran. The responses were typically prescriptive and reflected the adage that: "There's no teacher like real experience". A synthesis of the advise and suggestions is: Use a systematic approach and process by developing an overall development plan. First, identify the college's needs, potential, problems, and priorities. Then, identify the software that meets those needs, selecting hardware on which the software operates. Use technical assistance in planning, including consultants or resource people from other institutions, the state, firms/agencies but do not depend upon vendor representatives for this purpose. (They have a vested interest.) Have a competent head of computing and establish a computer advisory committee with membership that is representative of

the potential user groups. Conduct computer literacy training for all staff early. Determine policies related to distribution, location, and responsibility of microcomputers and know what is needed before any hardware purchases are made. Plan ahead and establish appropriate policies which address the array of problems that are inevitable pertaining to hardware, software, responsibility, staff, maintenance, priorities, human factors, time, security, and evaluation.

IMPLICATIONS FROM THE STUDY

A number of implications for the small college president are reflected in the results of this study. Some which should be helpful in guiding future efforts in the introduction, use, or evaluation of the new technology in the small two-year college are listed below.

Policy Planning Implications

1. Every institution should follow a systematic approach which results in an action plan for development, introduction, operation, maintenance, and assessment of microcomputing.

2. Comprehensive planning--for microcomputing, word processing, and other computing power--in all areas is essential for effective results.

3. A representative advisory committee including a technically qualified resource person should have responsibility for analyzing user needs, communications, resources, priorities, problems, and relationships.

4. Lack of hardware compatibility requirements can result in many different vendors' equipment being on one campus, which makes sharing of information, software, and support much more difficult.

Hardware Implications

1. More and more, computing will be on campus, interactive, and on-line using microcomputers and minicomputers.

2. Hardware acquisition can result in waste of financial resources, credibility, and acceptance among personnel, and poor services/usage unless anticipatory, and consistent policies are developed and followed throughout the college.

3. Hardware can become a status symbol, perceived by faculty and staff as a power base.

4. External consultant assistance is usually necessary in the small college in the needs assessment, software identification, and hardware

procurement phases to obtain the necessary level of expertise in these specialized areas.

5. Software costs will ultimately exceed the hardware cost during the life of a microcomputer.

6. Small colleges should purchase hardware, whether microcomputer or word processor, from 'name' vendors rather than considering price alone. (Recent industry problems such as Osborne Computers failure are indicative of the reasons.)

7. Microcomputing units that will serve as stand alone word processors or microcomputers but still link to the mainframe or minicomputer on campus are becoming the preferred type of equipment.

Software Implications

1. Though local development of software has been the most popular choice, it is also the most expensive method of obtaining software. Furthermore, locally developed software can be expensive and amateurish unless appropriate knowledge, talent, support, and control exist.

2. Software is a more crucial issue than the hardware itself in using the computer as an instructional tool. Lack of appropriate software makes the most elaborate microcomputer of little value.

3. Poor software can turn-off people of all ages to computers--an effect not easily overcome by quality software.

Personnel Implications

1. Staffing patterns indicate a great dependence upon assigning added responsibilities to existing personnel with little evidence that appropriate training or experiential preparation has been provided or was of sufficient quality and intensity to provide the level of expertise needed.

2. Training of faculty, staff, and administrators in computer literacy and use of both microcomputers and word processors would do much to alleviate the major problems found in introducing word processing and microcomputing on campus.

3. Much more training on both hardware and software

is needed at all levels.

4. Microcomputing labs usually require the addition of several lab assistants for equipment and software supervision and student assistance.

5. As the comments of the participants noted, a strong, competent head of computing on-campus is essential for effective integration and addition of microcomputers.

Costs/Funding

1. Most colleges are not dependent on federal funds for hardware purchase.

2. Despite much talk about vendor donation programs, very little hardware comes from private sources.

3. Though microcomputer or word processor costs are much lower than the cost of other computing power, costs will continue to be a major deterrent to expanded use.

FUTURE DIRECTIONS

Take a student and a teacher, give each a computer and a modem; link them via a communications package and the local phone line--add CAI packages for a course, and an electronic mail package--add more and more students, move them farther and farther apart, add more and more courses and we have the "electronic university" which will be a reality by the end of 1984--possibly serving a million students (Kirchner: 1983: 53). Does this scenario describe a far-sighted two-year college or university--no, it is an actual description of a new organization offering CAI courses to the public--Telelearning Systems, Inc. of San Franciso. Contrast this with a fear of robotics so great in a public junior college in Massachusetts that the trustees considered cancellation of a fully-funded robotics technology curriculum (Bartolik: 1983: 55).

Most two-year colleges will valiantly struggle between such extremes to "keep up" or "catch up" over the next two to three years, with microcomputers and word processors popping up like weeds all over campus. True to the definition of a weed as "a plant out of place"--many of these will be high tech weeds--consuming resources and not producing. Others will be appreciated for what they are and will be used well--turned into the very "staff-of-life" as faculty and administration at some colleges meet the challenge.

Hardware

Changes in hardware are the most dramatic--the quickest--of the areas of change impacting the use of microcomputers, word processors and associated technology on campus. There will be fewer manufactures of microcomputer and word processor hardware as the dominance of a few leaders, and knowledge of users grows. At the same time, the super-microcomputer will become as powerful as the current super-minicomputer using 16 bit and 32-bit technology and will include hard disk capacity with minicomputer comparable number of megabytes, and virtual storage.

Colleges, like industry, will turn more and more to IBM or DEC as well as Apple and TRS equipment. (A business research survey predicts 51 percent of the business market for IBM, DEC, and Xerox by 1985 with Apple and TRS holding 27 percent of the market (Collegiate Microcomputer: 1983: 91)).

The integration of computing and communications capability will begin but will be one of those areas in which colleges lag industry the most because of both the cost and the level of technical knowledge required. Major universities are moving in this direction as evidenced in the current plans of the universities profiled in "Campus Computing Strategies". In the smaller colleges, local area networks will be common within two to three years. Also, more multi-user microcomputer and/or word processing systems

will be installed. Electronic mail will be only experimental in most for several years. Sporadic use of off-campus data bases, whether for library searches or stock-market data, will increase but communications costs will prevent full exploitation of these resources at smaller colleges.

Software

Software for microcomputers is becoming more flexible, more sophisticated, and more portable. Companies like Digital Research are now making available compilers for COBOL and PL/1 as well as PASCAL and BASIC. These can change the nature of available application packages with the opportunity for upward compatibility. Unlike hardware, as software becomes more powerful, it will become more expensive. Neither HP's touch-control (Hewlett-Packard's new ability to touch the screen to give commands) nor Lisa's mouse (Apples hand-control to give computer commands) nor Lotus' 1-2-3 (a sophisticated software package on the IBM PC) will make effective computing effortless. Spread-sheets do take hours to learn to use and the data needed may have to all be keyed even though it was once produced on a report by a mainframe.

Word processing is already shifting from a hardware to a software issue as the advances in both blur the distinction between word processors that can compute and microcomputers that have word processing capability. Fewer and fewer dedicated word processors will be purchased in

two-year colleges since there is great pressure for units to serve multiple functions. This may mean a DECMATE II that is also a DEC VAX minicomputer terminal, or an IBM PC that is also an IBM 4331 mainframe terminal as examples.

Costs

Predominate costs have already shifted to personnel, not hardware. Yet, the microcomputer purchase decision is not trivial. A quality unit with appropriate peripherals still costs $3,000 to $5,000--but they are bought in groups, not single units--resulting in $30,000 to $50,000 expenditures each time--a 'tidy sum' indeed for a small college. There is currently a great naivete exhibited in the spending of many colleges as they purchase the most hardware for the money, ignoring software, personnel, and training costs. Since the hardware becomes out of date so rapidly and prices drop monthly, a wiser approach would be to spend across all areas so as to have a productive, fully utilized system quickly, and expand hardware as the need so justifies.

Personnel

Personnel at all levels and in all departments will be affected by microcomputers and word processors on campus--whether they use them or not.

One area in which two-year colleges lag industry is in the use of microcomputers or terminals by administrators. Though the placement and number of these in one's domain is a status symbol--many top level education administrators

such as presidents and vice-presidents regard computers as typewriters. Industry, on the other hand, is moving rapidly toward broad utilization of management work-stations. Workshops are now common for executives as well as for managers on how to make decisions with the aid of their microcomputers. The level of effectiveness of the use of microcomputers and word processors will depend upon the software purchased and the type of training, if any, provided the user. Untrained personnel will utilize the equipment like a fancy typewriter, unaware of the possibilities.

Policies

Policy issues facing the leading two-year colleges are now approaching more closely those of industry than in the past. As an example, both are now facing an immediate need to bring order--in the form of policies and procedures--to acquisition, support and use of microcomputers and word processors within the organization.

Microcomputers are bringing some independence from the college computer center for speciality areas such as public relations, research projects, 'what-ifs', spread-sheets, and resource development but are not likely to replace the central system for the college information system for student and financial data especially. What may frequently occur, however, may be micro data bases that are competitive with the main systems and so dilute the value of both.

The trend to incorporate microcomputing and word processing into existing jobs will continue. The major exception is that the informal service of providing startup and problem assistance that can now be found anywhere from the developmental studies lab to the computer center will need to be formalized as the demand for such assistance grows. In industry, this is represented by the "Information Center" concept, where a 'hotline' phone number reaches a person with both the hardware and people skills to help the user overcome a problem.

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